Endoscopic Treatment of Upper Gastrointestinal Ulcer Bleeding

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Abstract

Peptic ulcer disease is the most common cause of upper gastrointestinal (GI) bleeding. In most of the cases, bleeding from a peptic ulcer stops spontaneously. Arterial diameters in bleeding ulcers can measure up to 3.45 mm, but in most cases the diameter of the bleeding artery is small (<2 mm). High-dose intravenous proton pump inhibitors after endoscopic therapy for a bleeding ulcer reduce recurrent bleeding risk and surgery. The endoscopic appearance of an ulcer provides important prognostic information. Clean based ulcers and ulcers with a flat pigmented spot have low rebleeding risks. Major stigmata of hemorrhage (an adherent clot, a visible vessel, or active bleeding) are associated with high rebleeding risks. Endoscopic treatment in patients with high-risk stigmata results in improved outcomes. Common endoscopic techniques and the devices used to treat upper GI ulcer bleeding, including injection therapy, thermal coagulation, endoclip application, and hemostatic powder spray are described in the given video. Different clinical scenarios are presented. This article is part of an expert video encyclopedia.

Keywords

Endoclip; Endoscopy; Injection therapy; Standard endoscopy; Thermal coagulation; Ulceration; Upper gastrointestinal bleeding; Video.

Video Related to this Article

Video available to view or download at doi:10.1016/S2212-0971(13)70060-8

Materials

- Endoscopes: Olympus GIF-Q180; Tokyo, Japan.
- Epinephrine.
- Injection needle: Carr-Locke® Injection Needle; US Endoscopy, Mentor, OH, USA.
- Generator:
  - ERBE, Marietta, GA, USA.
  - ConMed, Chelmsford, MA, USA.
- Bipolar probes:
  - Solar® Probe; Olympus America, Center Valley, PA, USA.
  - Gold Probe®; Boston Scientific, Boston, MA, USA.
- Through-the-Scope Clipping Devices: Instinct® Clip; Cook Medical, Winston-Salem, NC, USA.
- Over-the-Scope Clipping (OTSC) Device: OTSC®; Ovesco Endoscopy AG, Germany.
- Hemostatic powder spray: Hemospray®; Cook Medical, Winston-Salem, NC, USA.

Background and Endoscopic Procedure

Peptic ulcers are the most common cause of upper gastrointestinal (GI) bleeding. In most of the cases, bleeding from a peptic ulcer stops spontaneously. Arterial diameters in bleeding ulcers can measure up to 3.45 mm, but in most cases the diameter of the bleeding artery is small (<2 mm). High-dose intravenous proton pump inhibitors after endoscopic therapy for a bleeding ulcer reduce recurrent bleeding risk and surgery. The endoscopic appearance of an ulcer provides important prognostic information. Clean-based ulcers and ulcers with a flat pigmented spot have low rebleeding risks. Prospective randomized trials have demonstrated that endoscopic treatment in patients with major bleeding stigmata results in a significant reduction in further bleeding, blood transfusions, the length of hospital stay, and the need for urgent surgery.

Appearance of the Ulcer and Major Stigmata of Bleeding

Endoscopic intervention is indicated in active bleeding, nonbleeding visible vessels, and active bleeding or visible vessels exposed after adherent clot removal. For actively bleeding ulcers, many experts advocate preinjection with 1 ml of 1:10 000 epinephrine in four quadrants to achieve temporary hemostasis and better visualization. If an adherent clot is seen, direct endoscopic suction and clot removal with a snare or biopsy forceps should be attempted to remove the adherent clot. Before clot removal and at the discretion of the endoscopist, the base of the adherent clot may be preinjected with 1 ml of 1:10 000 epinephrine in four quadrants. Once the clot is removed, any major stigmata of bleeding in the ulcer base must be ruled out.

Devices and Procedural Techniques

There are four commonly used endoscopic techniques in treating a bleeding ulcer: injection therapy; thermal coagulation; endoscopic clipping; and, most recently, hemostatic

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powders that are sprayed onto the bleeding ulcer. Injection therapy is commonly used for temporary hemostasis and improved visualization during significant active bleeding. The option to preinject is at the discretion of the endoscopist and often reflects personal preference. If visualization is optimal, including a clear view of the targeted vessel, a definitive intervention, such as clipping without preinjection may be used. During injection therapy, a variety of solutions, including epinephrine (1:10 000) and even normal saline, may be injected into the ulcer base in four quadrants using a catheter equipped with a retractable needle. Injection therapy delivers temporary local temponade and vasoconstriction. Injection therapy is usually utilized in combination with other more definitive techniques, such as thermal coagulation or clipping.

Thermal coagulation is another commonly used endoscopic technique to treat bleeding ulcers; it relies on thermal contact to achieve local temponade and coaptive coagulation of the underlying vessel. Bipolar and heater probes are preferred devices. Some bipolar probes incorporate an injection needle. The maximal temperature generated by the heater probe is 250 °C, whereas maximal temperature generated with the bipolar probe is 100 °C. In animal studies, both bipolar and heater probes are highly effective in achieving hemostasis and coagulating mesenteric arteries up to 2 mm in diameter. For a visible vessel and an active bleeding ulcer, many experts recommend using a 10-F bipolar or heater probe for therapy. However, a 10-F endoscopic device requires a therapeutic gastroscope. In the author's experience, coagulation with a 7-F probe is as effective as with a 10-F probe. Endotherapy using a 7-F probe is a more flexible option when the ulcer is located at the gastric cardia, lesser curvature, and in the duodenal bulb. During bipolar electrocoagulation and heater probe therapy, the probe is placed firmly on the bleeding lesion until cavitation or a 'footprint' is obtained. The energy output of the heat probe should be set at 30 J, and a minimal three coaptive pulses are applied. For bipolar thermal coagulation, the energy output should be set at 20 W with the probe firmly applied on the vessel for 8–10 s. For both probes, coagulation using the side or tip of the probe probably achieves the same therapeutic effect.

Increasingly, through-the-scope (TTS) endoclips are being used to ligate bleeding vessels. Studies have shown that endoclip application is equally effective in achieving hemostasis when compared to thermal coagulation. The advantages of using TTS endoclips include no special setup, expedient application, nonthermal application, and the ability to approximate ulcer or defect margins as well as to achieve hemostasis. Endoclips are particularly useful in treating rebleeding ulcers and continuously bleeding ulcers when adequate treatment with thermal coagulation fails. The downside is the increased cost associated with disposable clip devices. Earlier studies showed that older versions of the endoclip are less effective in achieving hemostasis if the bleeding artery is greater than 2 mm. Therefore, Food and Drug Administration-recommended endoclip application is restricted to vessels less than 2 mm in diameter. Newly available endoclips accommodate up to a 16-mm opening span, can be reopened and repositioned repeatedly, and are easily rotatable. Unlike older versions, Instinct® clips; Cook Medical, Winston-Salem, NC, USA are approved for magnetic resonance imaging (MRI) with field strengths up to 3 T. Early reports suggest that medium-sized arteries greater than 2–3 mm in diameter can be successfully ligated with the newer generation clipping devices. With these newer generation endoclips, *en face* or tangential application is equally effective. To maximize the amount of target tissue captured inside the endoclip during clip closure, suction is recommended with opened clip arms gently pressed over the target tissue immediately before clip deployment. Although a single endoclip may achieve hemostasis on a vessel, two clips are usually applied on a major bleeding stigmata, aiming to ligate the feeding vessel. Endoclip application can be used to guide angiographic embolization if needed.

Recently, hemostatic powder sprays and OTSC devices have been tested to treat ulcer bleeding, with promising results. A proprietary hemostatic powder (Hemospray®; Cook Medical, Winston-Salem, NC, USA) has been proven to be effective in high-pressure bleeding from external wounds, in a survival GI bleeding animal model, and in achieving hemostasis in malignant bleeding. The OTS clip (OTSC®; Ovesco Endoscopy AG, Germany) provides an additional advantage of approximating large defects. More clinical data are needed before the OTS clipping devices and hemostatic powders could be recommended for widespread use. Meanwhile, thermal coagulation, TTS endoclip application, and injection therapy are the mainstream therapeutic modalities for treating ulcer bleeding in the upper GI tract.

Recurrent Bleeding Risks and Complications

Major complications associated with endoscopic therapy are rare. Despite endoscopic therapy, independent risk factors associated with rebleeding include large ulcer size (>2 cm), active bleeding, posterior duodenal ulcer, lesser gastric curve ulcer, and hemodynamic instability. Relative inaccessibility, suboptimal visualization, and probable larger artery size associated with ulcers at the posterior bulb and lesser gastric curvature probably explain the high rebleeding and failure rates. Repeated treatment can be attempted in patients with recurrent bleeding, and permanent hemostasis can be achieved in approximately half these cases. Just more than 10% of patients require urgent angiographic embolization or surgery for bleeding despite endoscopic therapy. Routine second-look endoscopy does not change clinical outcomes and is not recommended.

Key Learning Points/Tips and Tricks

- Peptic ulcers are the most common cause of upper GI bleeding.
- In most of the cases, bleeding from a peptic ulcer stops spontaneously.
- High-dose intravenous proton pump inhibitors after endoscopic therapy for a bleeding ulcer reduce recurrent bleeding risk and surgery.

- The endoscopic appearance of an ulcer provides important prognostic information and helps to guide endoscopic intervention.

Endoscopic appearance of the ulcer	*Rebleeding risk*	*Endotherapy*	*Endoscopic intervention*
Active bleeding	High	Yes	Definitive therapy ± injection therapy
Nonbleeding visible vessel	High	Yes	Definitive therapy ± injection therapy
Adherent clot	Medium	Yes	Remove the clot and treat bleeding or visible vessel exposed after clot removal
Flat pigmented spot	Low	No	
Clean based	Low	No	

Definitive endoscopic interventions include thermal coagulation, endoclip application, and/or combination therapy.

The option to preinject is at the discretion of the endoscopist and often reflects personal preference. If visualization is optimal, including a clear view of the targeted vessel, a definitive intervention, such as clipping without preinjection may be used.

- Endoscopic techniques in treating a bleeding ulcer are the following:
  - Injection therapy.
  - Delivers temporary local temponade and vasoconstriction.
    - Improved visualization during significant active bleeding.
  - Thermal coagulation.
    - Bipolar and heater probes are preferred devices.
    - Provides local temponade and coaptive coagulation of the underlying vessel.
    - During thermal application, the probe is placed firmly on the bleeding lesion until cavitation or a 'footprint' is obtained.
  - Endoscopic clipping with TTS and OTS clips.
    - Endoclip application is equally effective in achieving hemostasis when compared to thermal coagulation.
    - Particularly useful in treating rebleeding ulcers and when thermal coagulation fails.
    - Newer generations of TTS endoclips offer long opening span, ratability, ability to reopen and reposition repeatedly, and MRI compatibility.
    - Endoscopic suction is recommended with opened TTS clip arms gently pressed over the target tissue immediately before clip deployment.
    - Endoclip application can be used to guide angiographic embolization if needed.
    - The OTS clip provides an additional advantage of approximating large defects.
  - Hemostatic powder spray.
    - Effective in achieving hemostasis in high-pressure bleeding from external wounds, in a survival GI bleeding animal model, and in malignant bleeding.
- Independent risk factors associated with rebleeding include 'LALPH':
  - Large ulcer size (>2 cm).
  - Active bleeding.
  - Lesser gastric curve ulcer.
  - Posterior duodenal ulcer.
  - Hemodynamic instability.
- Repeated treatment can be attempted in patients with recurrent bleeding with approximately 50% success rate.
- Routine second-look endoscopy does not change clinical outcomes and is not recommended.

Complications and Risk Factors

Primary failure in achieving hemostasis, rebleeding risk, and perforation.

Alternatives

Conservative management, proton pump inhibitors, angiographic embolization, and surgery.

Scripted Voiceover

Time (min:sec)	*Voiceover text*
00:01	Peptic ulcers are the most common cause of upper Gastrointestinal (GI) bleeding.
00:07	In most cases, the arterial diameters in bleeding ulcers measure less than 2 mm, but can be up to 3.45 mm.
00:19	The endoscopic appearance of an ulcer provides important prognostic information.
00:28	Endoscopic intervention is indicated in active bleeding, non-bleeding visible vessel, and active bleeding or visible vessel exposed after adherent clot removal.
00:44	This is a clean based gastric ulcer.
00:50	In general, flat pigmented spots are better visualized under digital chromoendoscopy such as narrow band imaging (NBI).
01:07	Within this posterior bulb ulcer, a flat pigmented spot can be seen.
01:25	In this patient, a large ulceration with an adherent clot can be seen at the gastric angularis.
01:35	Direct endoscopic suction, clot removal with a snare or biopsy forceps should be attempted to remove the adherent clot.
01:48	Once the clot is removed, any major stigmata of bleeding in the ulcer base must be ruled out.

01:58 A visible vessel is seen within the ulcer base.

02:08 For actively bleeding ulcers, many experts advocate pre-injection in four quadrants to achieve temporary hemostasis and better visualization.

02:22 Injection therapy delivers temporary local tamponade and vasoconstriction.

02:34 Some bipolar probes incorporate an injection needle.

02:43 During thermal coagulation, the bipolar or heater probe is placed firmly on the bleeding lesion to achieve local tamponade and coaptive coagulation of the underlying vessel.

03:01 A visible vessel is seen within the duodenal ulceration.

03:09 Thermal coagulation using a bipolar probe is used to achieve coaptive coagulation.

03:19 The probe is placed firmly on the vessel until cavitation or a "foot print" is obtained.

03:30 For bipolar thermal coagulation, the energy output should be set at 20–25 W with the probe firmly applied on the vessel for several seconds.

03:44 The tip of the probe is flushed with water after each thermal application.

03:54 In the settings of a visible vessel or an adherent clot, the option to pre-inject is at the discretion of the endoscopist and often reflects personal preference.

04:12 In our experience, coagulation with a 7 F probe is as effective as with a 10 F probe.

04:23 Endotherapy using a 7 F probe is a more flexible option when the ulcer is located at the gastric cardia, lesser curvature, and in the duodenal bulb.

04:40 For both bipolar and heater probes, coagulation using the side or tip of the probe probably achieves the same therapeutic effect.

04:59 Several cycles of treatment can be performed until cavitation or a "foot print" is obtained.

05:16 Increasingly, through-the-scope (TTS) endoclips are being used to ligate bleeding vessels.

05:25 Studies have shown that endoclip application is equally effective in achieving hemostasis when compared to thermal coagulation.

05:38 Newly available endoclips accommodate up to a 16 mm opening span, can be reopened and repositioned repeatedly, and are easily rotatable.

05:54 Unlike older versions, Instinct® clips are approved for MRI with field strengths up to 3 T.

06:06 The advantages of using endoclips include no special setup, expedient application, non-thermal application, and the ability to approximate ulcer or defect margins as well as to achieve hemostasis.

06:25 Some versions of the endoclips have excellent rotational ability.

06:43 A visible vessel can be seen in this antral ulcer.

06:50 Endoclip application provides the ability to approximate the ulcer or defect margins as well as to achieve hemostasis.

07:03 With these newer generation endoclips, en face or tangential application is equally effective.

07:16 To maximize the amount of target tissue captured inside the endoclip during clip closure, suction is recommended with opened clip arms gently pressed over the target tissue immediately before clip deployment.

07:41 This patient has an actively bleeding duodenal ulcer with an adherent clot.

07:50 With direct endoscopic suction, the adherent clot is removed.

08:00 Active oozing stopped spontaneously and a visible vessel is exposed.

08:11 We proceed with endoclip application without pre-injection.

08:26 The opened endoclip should be directed at the base of the visible vessel.

08:35 The opened clip arms are gently pressed over the target vessel.

08:42 Endoscopic suction is applied before clip deployment.

08:56 This patient has a bleeding duodenal ulcer without an adherent clot.

09:03 Despite active oozing, optimal visualization of the ulcer base can be achieved.

09:15 In this situation, the option of pre-injection is at the discretion of the endoscopist.

09:25 In our experience, if the visualization is optimal including a clear view of the target vessel or ulcer base, a definitive intervention such as clipping without pre-injection may be used.

09:45 Although a single endoclip may achieve hemostasis on a vessel, two clips are usually applied on a major bleeding stigmata aiming to ligate the feeding vessel.

10:06 In this case, a visible vessel is seen within a large and likely chronic ulceration after clot removal.

10:19 Without pre-injection, two endoclips are placed on the visible vessel.

10:30 Newer generations of endoclips are often able to penetrate the scar tissues associated with chronic ulcerations.

10:45 Endoclip application can be used to guide angiographic embolization if needed.

11:00 In approaching ulcer bleeding, over-the-scope clipping devices can also be used.

11:10	This video case is provided by Dr. Thomas Kratt.
11:16	The patient is receiving anti-coagulation and there is an actively spurting antral ulceration.
11:26	Hemostasis is immediately achieved with an over-the-scope clipping device application (i.e., Ovesco endoclip_.
11:45	During routine follow up endoscopy, the over-the-scope clipping device is seen in a good position and around the ulcer crater.
12:00	Gradual healing of this antral ulceration is documented on follow up endoscopies.
12:22	This video case is provided by Dr. Enric Brullet.
12:30	Spurting arterial bleeding is seen from this malignant ulceration.
12:38	Endoscopic treatment options are very limited in this situation.
12:48	With hemostatic powder spray, hemostasis is achieved conveniently.
13:11	Thank you for your attention.

Further Reading

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